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College of the Liberal Arts
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Dear Paul,

First of all, I feel somewhat frustrated in trying to put comments on paper. When you write something, it acquires a kind of permanence which a spoken comment does not imply. I really need more information regarding a number of the subtasks both from the contractor and the sponsor. If possible, I could certainly be of more help in a face-to-face situation as I am sure that many of my comments or the thoughts on which they are based could easily be answered. With these reservations, here are my observations ordered according to subtasks:

1. Performance measures: This research would seem to me to deserve a high priority. Practically none of the so-called research in image evaluation has had the benefit of objective performance measures. Without such quantitative indicators, one can simply not be scientific. The contractor's proposal appears to be well thought out and well written. My only suggestion is that you might want to get a reading from someone like [redacted] not so much in evaluation, but for suggestions to the contractor as to how the research may be carried out.

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2. TICOF seems like a splendid concept. It is often the case that ideas and concepts which seem reasonable in the abstract run into difficulties which one attempts to apply them. This is especially true in operational situations such as yours. TICOF would provide a check on these ideas, and also serve a teaching and demonstration function.

3. Interpreter-machine dynamics: This proposal was not as impressive as the first two. The contractor is relying heavily on the work carried out by [redacted] which I have not read. What is the experience of the contractor in this area?

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4. Image-characteristics: This is an area in which AFRO has had extensive experience and, if at all possible, they should be consulted. I cannot determine, without additional information, whether such an analysis would be of value to you. Do you not evaluate all imagery independent of its quality? On the other hand, I am certain that the kind of data which one may obtain from this type of research would be invaluable to engineers designing sens-

ing systems. At this point, I should not comment without further information.

5. Image-utilization/stereo: Almost everyone I have interacted with during my survey commented, usually with emotion, regarding the value of stereo. My own observation based on the available data and our knowledge of the visual system is that stereo should be unquestionably useful under some conditions, would appear to be helpful under others, and of no value in some cases. I do not quarrel with [] al's results, but feel that their conclusions cannot be generalized. Clearly, what is needed is a definitive study using ground truth. Unless the problem is attacked systematically and comprehensively, the data will be of limited usefulness and will add to rather than detract from the considerable confusion which now exists. The scope of the contractor's proposal does not strike me as being adequate to produce definitive conclusions. I think they could do a real good job on this problem if supported and encouraged.

I will not comment on the apparatus problems.

6. Visual mechanisms: This is the area concerning which we have had much discussion over the past several months. Repeating our recent phone conversation, I have two reservations regarding the study of accommodation: 1) Is the measure of accommodation of value in predicting or monitoring interpreter performance? This is tacitly assumed in the proposal, but I have not seen the supporting evidence. Accommodation is a critically important visual mechanism, but to single it out as the most relevant to your situation requires justification. For example, why is accommodation more promising than blink rate, fusional range, or even pupil diameter, all of which are linked in the literature to visual performance? What is the value of studying blood flow by infrared techniques (my personal bias)? Unfortunately, accommodation is the most difficult of all these measures to quantify. If I were in a position to make a decision, I would insist on more justification, particularly in view of the relative difficulty of measuring accommodation in the operational context. 2) We discussed the precision of the ultrasonic technique before and I pointed out that [] questioned both the validity and precision of the method. You indicated that your recent trip to [] was reassuring with respect to the precision aspect. However, we laboratory types are eternal optimists and you should bear in mind that the justification is not yet in the literature, has not passed the test of critical editorial review, and has not been checked by other investigators. Also, it might be wise to make a mental note that laboratory scientists are notoriously inaccurate regarding when their research will be completed. This latter comment would be particularly applicable in relation to your operational situation.... Overall, I am pessimistic about this subtask. [] could

give you a more educated guess regarding the measurement problems.

7. Not qualified to comment without additional information.

STAT 8. Illumination: I am most familiar with this subtask by virtue of previous discussions with you and with [redacted] My feeling is that research on illumination at this stage is of limited value. There is already a vast literature on this problem which should permit specification of illumination levels and color temperature values which would account for the majority of the variance attributable to these variables. Additional research will be useful, but its value in the total context would seem to me to be small.... As you know, we discussed these issues when you and [redacted] and also during our conference phone conversation. The main justification given for this research was based on an unpublished master's thesis at Ohio State on size perception. I feel that size is only marginally related to the kinds of visual tasks with which your organization is concerned. I would prefer to discuss this face-to-face. However, the evidence available to me does not support a strong recommendation for this line of investigation.

9. Mensuration: Not qualified to comment

10. Aural collateral: Could not be supported on the basis of the present proposal.

STAT 11. State-of-the art review: These can be valuable but only if properly carried out. For example, if the reviewer can digest and evaluate the material so that the written material is relevant to your operation, then this compilation would be valuable. If, on the other hand, the review simply lists uncritically the studies falling under the various headings in the outline, the only advantage is the saving of some time in the library. Take for example the value of stereo viewing. There are at least a thousand papers on this topic concerned with range finders, image evaluation, pathology, perception, etc. The information of value to your people would be in the form of statements similar to what I indicated above i.e., that stereo is of value under some but not all conditions, and that these have to be identified. A listing of all the studies might simply be confusing. One could do better by making a few telephone calls. I cannot help but be reminded of the review you gave me, by I think [redacted] which listed studies uncritically, some of which had no relevance at all to your problems. Most reviews I have seen are not very helpful. This contractor could do an excellent job if so instructed by the sponsor.

Please call if there are any questions.

Sincerely,

[redacted]
Professor of Psychology